

Effect of Oregano Herb on Dough Rheology and Bread Quality

Review Article

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Abstract

The effect of addition of oregano at 1, 2, 3 and 4 % in formulation was examined in order to obtain herbal, antioxidant-enriched bread with good baking, textural, nutritional and sensorial properties. Oregano was found to be rich in crude fibre (17.43%), total phenol content (87.80 GAE/100g DW) and antioxidant activity (84.80%) which strengthens its use as a functional food. Farinograms obtained after addition of oregano suggested that oregano increased water absorption and dough development time. A significant decrease in dough stability was also observed. Therefore, little modifications were done in baking procedure to prepare oregano bread. Increasing levels of oregano increased the baking absorption and specific volume of the bread. From sensory point of view 2% level of oregano in the bread was selected as best. Oregano bread was high in total phenolics content (TPC) and radical scavenging activity (RSA). Result suggested that oregano up to 2% level in bread can be added without any major change in baking and sensory properties along with better shelf life.

Keywords: Oregano; Total phenol content; Antioxidant activity; Farinograms; Baking; Sensory properties.

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Introduction

In the last decades consumer demands in the field of food production has changed considerably. Consumers believe that foods contribute directly to their health (Chen, 2011; Mendis and Kim, 2011; Siro et al., 2008). The practice of using nutritional knowledge in food product to improve the health of consumer forms the general concept of functional foods (Peressini & Sensidoni, 2009). In this respect, phytochemicals have received increased attention because of their biological significance and potential positive health effects (Hayta and Gamze, 2011). Herbs have been considered as the most usable resources for the development of nutraceuticals - functional foods (Arsic, 2003). Oregano is known for its high antioxidant activity (Amarowicz et al., 2009; Kim et al., 2012). Antifungal activities of oregano is attributed carvacrol (Burt, 2004; Kocić-Tanackov et al., 2012). Moreover, it has additional advantages as flavor enhancer, apart from being beneficial to health; it adds variety to the food.

Baked foods are suitable for functional food development because of their nutritive value and their value as carriers of bio-active component. Bread is the major bakery product and consumed worldwide in relatively large amounts. Functional breads formulated with bioactive compounds are becoming important in the bakery industry, and various ingredients are being used to improve the health benefits of the final product.

This study was aimed to evaluate the effects of different amounts of oregano and thyme on the quality characteristics herbal breads. Moreover the possibility to obtain an antioxidant-enriched final product with good shelf life was studied.

Material And Methods

Materials

The dried oregano was purchased from a local market, dried, grounded, packed in sterilized plastic bags and treated in microwave for 915 MHz for 1 min. Wheat flour, yeast, salt, sugar etc purchased from local market for bread making.

Physicochemical properties of raw materials

Prescribed protocols of AACC (2000) procedures for moisture, ash, protein and fibre were thoroughly followed.

Determination of anti-oxidant capacity of cinnamon

The antioxidant activities of cinnamon powder was evaluated through free radical scavenging effect on 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical. The determination was based on the method proposed by Akowuah et al. (2005). Percentage of DPPH scavenging activity was calculated as % inhibition of

$$\text{DPPH} = [\text{Abs control} - \text{Abs sample} / \text{Abs control}] \times 100$$

Determination of total phenol content

Total phenolic contents of all plants extracts were determined using Folin-Ciocalteu reagent as described by Singlaton & Rossi (1965). Samples were inserted into different test tube and mixed thoroughly with 5 ml Folin-Ciocalteu reagent (previously pre-dilute 10 times with distilled water). After 5 mins, 4 ml of 7.5% sodium carbonate was added and allowed to react for 2 hrs at room temperature. The absorbance was measured at 765 nm using spectrophotometers. Samples were measured in three replicates. Standard curve of gallic acid solution (10, 20, 40, 60, 80 and 100 ppm) was prepared using the similar procedure. The results were expressed as mg GAE/100 g extract sample.

Bread

Straight dough AACC method (Anonymous, 1990) numbered 10 – 10 B was followed. The formula for control was as: flour-100 g, Compressed yeast-3.0 g, Sugar-2.5 g, Bakery shortening-2.0 g, Salt / NaCl-1.0 g, Potassium bromated 1 ppm, Water Optimum. The dough was prepared and baking schedule is given as: Fermentation-45 min, Remixing-25 sec, Recovery-20 min, Sheeting and moulding-3 min, Proofing (at 86 ° F, RH 75%)- 55 min, Baking-25 min at 450 ° F.

Bread quality

The loaves were analyzed for specific volume (cc/g) and loaf height (cm).

Sensory quality

Sensory evaluation for appearance, color, texture, flavor and overall acceptability was carried out the next day by a panel of minimum ten semi trained judges on nine point hedonic scale (Larmond, 1970).

Texture analysis

Hardness was measured as an index of bread texture by Stable Micro System Texture Analyser Model (TA-H di England) using settings as Test-TPA, Probe-75 mm Cylindrical, Pre-test speed-1 mm/s, Test speed-1 mm/s, Post-test speed-1 mm, Force- 250kg.

storage studies

Bread samples were packed in low density polyethylene bags and analyzed for visual mold growth for a week at room temperature (30±50°C)

Statistical Analysis of data

The data collected on different characteristics were analysed with the help the software CPCS-1(Singh et al., 1991). All results were expressed at 14% moisture basis unless otherwise stated. Each value was mean of three observations.

Result And Discussion

Dried oregano was blended at 1-4% level in flour and studied for farinographic characteristics (Table 1). Addition of oregano increased water absorption as compared to control. Oregano at 4% level had maximum water absorption (55%). Dough development time also increased from 2 minutes at 1% to 4 minutes at 4% level of incorporation of oregano in the flour. There was a decrease in dough stability up to 3 % level of incorporation of oregano in the blend. Oregano significantly decreased the mixing tolerance index from 70 to 45 BU as levels of incorporation increased from 1 to 4 %. This showed that there was weakening of dough with addition of oregano in the bread. So the baking process had to be modified accordingly.

Effect of incorporation of oregano on baking quality of bread.

Figure1: Farinograms obtained after addition of dried oregano at different levels

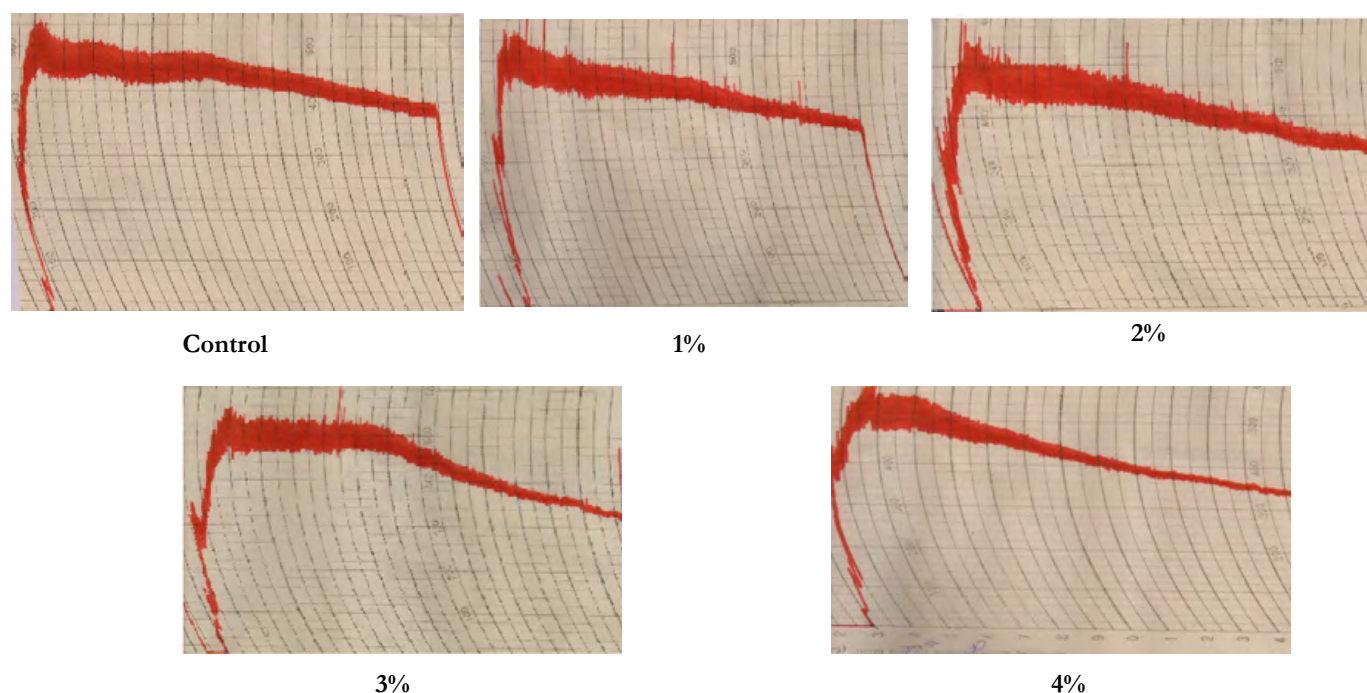


Table 1: Chemical composition, total phenol and antioxidant activity of raw material

Samples	Moisture (%)	Protein (%)	Fibre (%)	TPC (mg GAE/100g DW)	RSA (DPPH % inhibition)
Wheat flour	12.03±0.56	9.17±1.09	0.49±0.08	3.78±0.21	17±2.13
Dried Oregano	8.23±0.67	9.06±0.78	17.43±1.67	87.80±3.21	84.80±4.67

Table 2: Effect of incorporation of dried oregano on farinographic characteristics of flour

Samples	Level (%)	Water absorption(%)	Dough development time(min)	Dough stability(min)	Mixing tolerance index(B.U.)
Control	0	53.00±1.56 ^a	1.50±0.15 ^a	4.00±0.56 ^c	80.00±2.45 ^d
	1	53.30±2.15 ^a	2.00±0.09 ^a	2.00±0.20 ^a	70.00±1.89 ^c
	2	53.90±2.45 ^b	2.00±0.19 ^a	2.00±0.17 ^a	80.00±3.60 ^d
Oregano	3	54.30±2.67 ^c	3.00±0.23 ^b	3.00±0.32 ^b	60.00±3.50 ^b
	4	55.00±1.84 ^d	4.00±0.37 ^c	4.00±0.19 ^c	45.00±2.70 ^a

Table 3: Effect of incorporation of oregano on baking quality of bread

Samples	Level (%)	Bake absorption(%)	Loaf height (cm)	Specific volume (cc/g)	Hardness (Kg)	Overall acceptability (score out of 9.0)
Control	0	70.12±1.17 ^a	9.21±0.55 ^b	4.72±0.29 ^b	1.39±0.09	7.90±0.78 ^a
	1	72.24±1.08 ^b	9.20±0.29 ^b	4.82±0.21 ^b	1.38±0.12	8.12±1.16 ^b
Oregano	2	73.89±2.12 ^{bc}	9.25±1.07 ^{bc}	4.76±0.15 ^b	1.35±0.14	8.39±0.89 ^c
	3	74.35±1.89 ^c	8.59±0.67 ^a	4.39±0.19 ^a	1.36±0.07	8.01±0.45 ^a
	4	75.00±1.23 ^d	8.3±0.79 ^a	4.22±1.14 ^a	1.32±1.17	7.95±0.65 ^a

The bread-baking data are shown in Table 3. Significant variations were observed in various parameters of bread making when breads were prepared by incorporation of dried oregano at 1, 2, 3 and 4% level in flour. Incorporation of oregano at increasing level showed an increase in baking absorption as compared to control. At 2% level of oregano, water absorption was 72.24 % and it increased to 75 % at 4 % level. Oregano also increased the loaf weight from 145g at 1 % level to 149g at 4 % level of oregano in the bread. Specific volume (4.72 cc/g) was best at 1% level and decreased to 4.22 cc/g at 4% level of oregano in the blend. This showed that increased level of oregano had a detrimental effect on the specific volume of bread.

The increasing water absorption might have been caused by the strong water-binding ability of fibers present in oregano. The increasing bread weight was caused by high water retention. The decreasing loaf volume was due to the dilution of gluten and also could have resulted from the interaction between gluten and fiber material of spices and herbs (Chen et al.,1988). Oregano contained significant amount of insoluble fibre which dilutes and

disrupts gluten network and probably weakens the interaction between gluten and starch (Noort et al., 2010; Ronda et al., 2012).

Further oregano bread was tested for sensorial properties and observed that oregano bread had better acceptability as compared to control. Overall acceptability score varied from 8.38 to 7.95. Results of sensory analysis suggested that the addition of herbs in the bread had a positive response towards consumer acceptability. The bread incorporated with oregano at 2% level had higher acceptability than the control. Ivanovski et al. (2012) reported an increase in acceptability of bread with supplementation with herbs. Incorporation of oregano had a non-significant effect on hardness (N) of bread. The hardness for control bread was 1.39 N. Bread contained 1% oregano had a hardness value of 1.38 N, which further reduced to 1.32 N at 4% level.

Effect of incorporation of oregano on total phenol content and antioxidant activity of bread.

Table 4: Effect of incorporation of oregano on total phenols and antioxidant activity of bread

Samples	Level (%)	Parameters	
		TPC (mg GAE/100g DW)	RSA (DPPH % Inhibition)
Control	0	0.23±0.02	4.67±0.67
	1	1.05±0.23	12.45±0.45
Oregano	2	0.82±0.12	17.81±0.89
	3	0.96±0.17	21.23±1.12
	4	1.67±0.13	23.14±1.89

Oregano bread (2%) had a TPC of 87.80 ± 1.32 mg GAE/100g DW and RSA $84.80 \pm 1.89\%$, respectively (Table 4). Results are in accordance with (Shan et al., 2005). Data indicate that oregano bread had an increase of phenolics amount of approximately three-time compared to the quantity contained in the control. Results of radical scavenging activity are consistent with those obtained from measurement of total phenolics. Similar results were reported by (Kim et al., 2012)

Storage Study.

Breads prepared with best 2% oregano were packed in LDPE and stored at ambient temperature and checked for visible mold growth on daily basis. Effect of incorporation oregano in bread on visual mold growth is given in Table 5. Control bread which contained no preservative spoiled within three days. No. Oregano bread had a shelf life of 6 days. Inhibitory action of oregano against bakery mold was reported by (Gordana et al., 2009; Kocić-Tanackov et al., 2012; Omidbeygi et al., 2007).

Conclusion

Water absorption and dough development time increased by adding oregano. Dough stability decreased as level of oregano increased in the blend. Oregano showed a decrease in mixing tolerance index as the levels of oregano increased in flour. Addition of oregano at 1-4% changed the bread-making performances. An increased baking absorption and specific volume observed for oregano bread than control. Oregano bread had no significant effect on the texture of bread. Results of sensory analysis suggested that addition of oregano in bread formula up to 2 % level of incorporation did not interfere in bread acceptability. Oregano bread was awarded more scores than control. Incorporation of oregano markedly increased the total phenol content and the radical scavenging activity of bread. Oregano bread had a shelf life of 6 days at room temperature. Therefore oregano could be regarded as a potential health-promoting functional ingredient.

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